

***FAT GRAFT MYRINGOPLASTY: REPAIR OF SMALL DRY
CENTRAL PERFORATION OF TYMPANIC MEMBRANE***

A PROSPECTIVE CLINICAL STUDY

DISSERTATION SUBMITTED FOR

MASTER OF SURGERY

BRANCH IV

(OTO-RHINO-LARYNGOLOGY)

MAY 2018



THE TAMILNADU

Dr. M.G.R. MEDICAL UNIVERSITY

CHENNAI, TAMILNADU

BONAFIDE CERTIFICATE

This is certify that this dissertation entitled “***FAT GRAFT MYRINGOPLASTY: REPAIR OF SMALL DRY CENTRAL PERFORATION OF TYMPANIC MEMBRANE A PROSPECTIVE CLINICAL STUDY***” submitted by **DR.T. DHANALAKSHMI** to the Tamil Nadu Dr. M.G.R Medical University, Chennai in partial fulfillment of the requirement for the award of M.S Degree Branch- IV (OTO-RHINO-LARYNGOLOGY) is a bonafide research work carried out by her under my direct supervision and guidance during the tenure of her course in M.S. ENT from May 2015 to April 2018.

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MADURAI MEDICAL COLLEGE AND GOVERNMENT
RAJAJI HOSPITALS

This is to certify that this dissertation entitled “*FAT GRAFT MYRINGOPLASTY: REPAIR OF SMALL DRY CENTRAL PERFORATION OF TYMPANIC MEMBRANE A PROSPECTIVE CLINICAL STUDY*” is a bonafide and genuine research work done by **Dr.T. DHANALAKSHMI** in partial fulfillment of the requirement for the degree of M.S Degree Branch- IV (OTO – RHINO - LARYNGOLOGY) under guidance of **PROF.DR. N. DHINAKARAN, M.S. ENT.,** Professor, Department of OTO-RHINO-LARYNGOLOGY .

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DECLARATION BY THE CANDIDATE

I, **DR.T. DHANALAKSHMI** declare that, I carried out this work on, ***FAT GRAFT MYRINGOPLASTY: REPAIR OF SMALL DRY CENTRAL PERFORATION OF TYMPANIC MEMBRANE A PROSPECTIVE CLINICAL STUDY***” at the Department of ENT, Madurai Medical College during the period from August 2016 to July 2017. I also declare that this bonafide work or a part of this work was not submitted by me or any others for any award degree or diploma to any other University, Board , either in India or abroad.

This is submitted to The Tamil Nadu Dr.M.G.R Medical University, Chennai in partial fulfillment of the rules and regulations for the MS DEGREE examination in OTO –RHINO-LARYNGOLOGY.

Place: Madurai

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INTRODUCTION

Tympanic membrane perforation is mostly due to infection, trauma or Post Tympanostomy tube insertion. Mostly it heals spontaneously; however recurrent infection may interfere with regenerative process and result in chronic perforation.

Long standing tympanic membrane perforation may cause hearing loss and middle ear infection even if the size of perforation is small.

Myringoplasty is one of the most commonly performed otologic surgical procedures, which involves use of graft material to repair of tympanic membrane perforation.

Tympanoplasty refers to any operation involving reconstruction of the tympanic membrane and/or the ossicular chain. Myringoplasty is a tympanoplasty without ossicular reconstruction. Over the years many methods have been used for closing perforations. The most widely used and accepted method is underlay graft of Temporalis fascia or sometimes perichondrium.

The basic procedure is to excise the rim of the perforation so that there is a raw surface from which new tissue will grow. The mucosa on the undersurface of the remaining tympanic membrane near to the perforation is removed or scraped with a sickle knife or similar instrument to provide a bed for the graft. Then the graft is placed under the tympanic membrane remnant and acts as a scaffold for new growth of the squamous epithelial layer. The mucosa over the promontory should be carefully preserved to reduce the likelihood of postoperative adhesions between the graft and the promontory.

Since the development of Myringoplasty surgery, various graft materials have been used for repair of tympanic membrane perforation. These graft materials can be autologous, homologous or synthetic materials. Nowadays, Autologous temporalis fascia graft is the most widely used graft material followed by perichondium. Temporalis fascia graft needs external incision and possible visible scar which was used since 1950.

Without closure of tympanic membrane perforation, the morbidity may include hearing loss, chronic otorrhoea and cholesteatoma formation.

The purpose of Fat Graft Myringoplasty is to repair such perforation and tends to improve hearing and eliminate the susceptibility to middle ear infection.

Myringoplasty is the daily challenge of an Otorhinolaryngologist practice. As the debate continues on which method is the most preferable on various patient. Our job is to decide on most compromising surgery that will lead to maximum success.

The Fat Graft Myringoplasty was 1st introduced by Ringer berg²⁸ in 1962 as an Office based Procedure.ear lobule fat was used as graft in this study. Fat graft Myringoplasty is done by transcanal technique cy using Otoendoscopic guidance. Mostly done under local anesthesia. patient can be discharged on the same day.

“Fat Myringoplasty”

“Myringo” = tympanic membrane

-“plasty” = a surgical procedure for the repair, restoration, or replacement (as by a prosthesis) of a part of the body

This procedure involves repairing a small perforation in the eardrum with a small piece of fat taken from the earlobe or abdomen by Plugging technique.

Fat is an active material which is said to have angiogenetic properties. It has been an accepted material for closure of small tympanic membrane perforations in literature.

Day care surgery is the need of hour in the field of otology. Temporalis fascia is the most common material used for closure of tympanic membrane perforation. But it is a lengthy procedure sometimes requiring general anesthesia (GA) or longer sedation, extensive middle ear manipulation and a longer recovery post operatively.

Advantages:

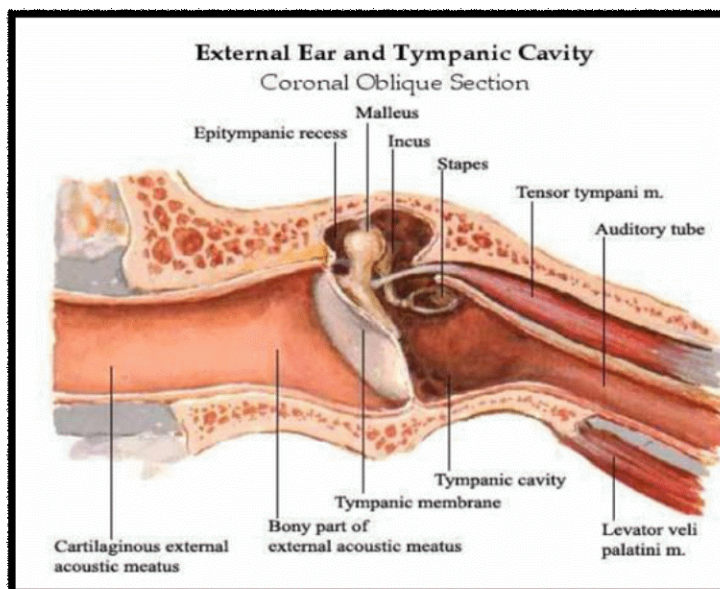
Fat graft Myringoplasty has many advantages as it is

- Simple to harvest and handle the graft material,**
- Cost effective,**
- Minimally invasive one,**
- Under local anesthesia as a day care procedure.**
- In this technique, possible complications of Classical technique such as Middle ear manipulation can be avoided.**

The principal aim of fat graft Myringoplasty is the complete closure of the small tympanic membrane perforations with a simple, short, cost effective procedure, least in pain and trauma to the healthy ear drum due to the absence of skin incisions, dissections of meatal flaps and fewer complications with maximum improvement of the air/bone gap after the procedure.

TYMPANIC MEMBRANE:

It forms lateral wall of tympanic cavity. The tympanic membrane lies at the medial end of the external auditory meatus. [fig. 1] It is slightly oval in shape, being broader above than below. It is pearly white in color and obliquely set in the tympanic annulus. It measures 9 -10 mm in height, 8 -9 mm wide and 0.1 mm thickness. It contains two parts 1) Pars tensa 2) pars flaccida.



Picture - 1

The periphery of the Pars tensa is thickened to form **Annulus Tympanicus** which fits into the **tympanic sulcus**. And the central part is tented inwards at the level of tip of the Malleus, known as **Umbo**.

Pars flaccida is also known as **Shrapnel's membrane** which is situated above the Lateral process of Malleus between Notch of Rivinus and Anterior and Posterior Malleal folds.

Tympanic membrane contains 3 layers.

1] Outer epithelial layer- it continues with skin of external auditory meatus.

2] Inner mucosal layer – continues with mucosa of tympanic cavity

3] Middle fibrous layer / **Lamina Propria** - it encloses the Handle of Malleus. It has three types of fibers. i.e. outer radial, inner circular and parabolic fiber arrangements.

This arrangement probably accounts for the complex pattern of tympanic membrane displacement during sound stimulation. In the pars flaccida, the lamina propria is less marked and the orientation of the collagen fibers seems random.

When the tympanic membrane is perforated by either trauma or infection, the extent of fibrous tissue proliferation determines the thickness of the healing membrane. The replacement membrane may develop a dense intermediate fibrous layer or alternately may fail to develop a fibrous layer, resulting in a thin membrane composed only of epidermal and mucosal layers.

The tympanic membrane firmly attaches to the malleus at the lateral process and at the umbo; between these two points, only a flimsy mucosal fold, the **Plica mallearis**, connects the tympanic membrane to the malleus.

It develops from all three germinal layers – ectoderm, endoderm and mesoderm.

Chorda tympani nerve runs in between the mucosal and fibrous layer of tympanic membrane.

Tympanic membrane makes 55° angle with the floor of external auditory canal.

Blood supply of TM:

Tympanic membrane gets blood supply from 1) Epidermal vessels from deep auricular branch of Maxillary artery, 2) Mucosal vessels from anterior tympanic branch of maxillary artery, stylomastoid branch of Post auricular artery and middle meningeal artery. These arteries form extensive anastomosis with in connective tissue layer of Lamina propria.

Nerve supply:

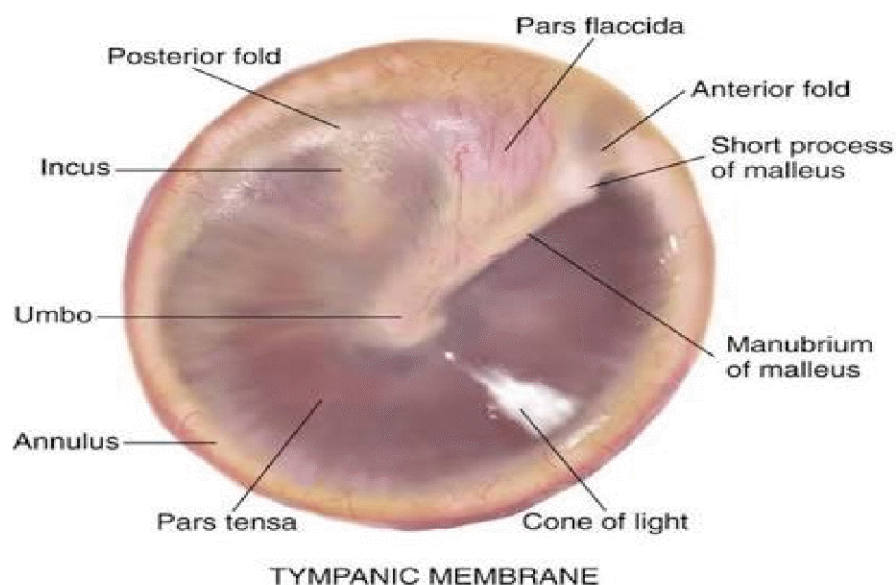
Lateral surface of tympanic membrane supplied by Auriculotemporal nerve in anterior part, auricular branch of Vagus nerve [Arnold's nerve] in posterior half and the medial surface is supplied by Tympanic branch of Glossopharyngeal nerve. [Jacobson's nerve]

These also run in the lamina propria and, while variations and overlaps are considerable, both the vascular supply and innervations are relatively sparse in the middle part of the posterior half of the tympanic membrane.

Landmarks in tympanic membrane: [Picture - 2]

- 1). Handle of Malleus is 1'O clock for right side and 11'O clock for left TM.
- 2). Umbo at inferior end of Handle of Malleus.
- 3). Cone of light in anteroinferior quadrant.
- 4). Anterior and posterior malleal fold attaches to lateral process of Malleus.
- 5). Long process of Incus and incudostapedial joint lie in between Handle of Malleus and Posterior meatal wall.
- 6). Pars flaccida lies above the level of malleal folds.

Picture -2 showing landmarks in tympanic membrane:



The conically shaped tympanic membrane is tilted anteroinferiorly. As a result of this, the anteroinferior bony wall is longer than the posterosuperior one, and the anterior tympanomeatal angle is more acute than the posterior.

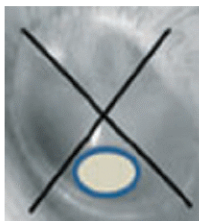
Pars tensa of tympanic membrane is divided into four quadrants by two lines. These are vertical line along the Handle of Malleus and horizontal line at the level of Umbo.

TYPES OF TM PERFORATION: [Picture – 3]

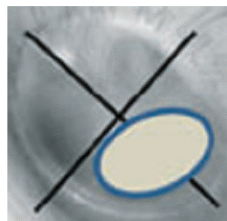
Central perforation is perforation in Pars tensa of tympanic membrane and all the margins of the perforation are surrounded by Pars tensa. It can be small / pinpoint, large, subtotal or total.

Picture - 3

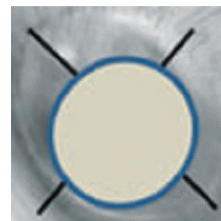
Small CP



Medium CP



Large CP



Subtotal CP



Small / pinpoint perforation involves < 25% or one quadrant,

Large – one to two quadrant,

Subtotal- involving all four quadrants with remnant tympanic membrane,

Total – it also involves tympanic annulus.

Marginal perforation can be posterosuperior, anterior, inferior or total. Posterosuperior marginal perforation is most common. It destroys even annulus and reaches tympanic sulcus. It is dangerous because from the external acoustic meatus in growth of epithelium into middle ear by immigration and forms Cholesteatoma.

Movements of tympanic membrane are more at periphery than at centre where the handle of Malleus is attached. It is known as “**Curved membrane effect**”.

According to Wever and Lawrence, the surface area of tympanic membrane is 90mm^2 and only 55mm^2 is functional. The natural resonance and efficiency of tympanic membrane is 800 to 1600 Hz. Area of Stapes footplate is 3.2mm^2 .

The area of tympanic membrane is much larger than area of footplate of Stapes and the average ratio between two being 21:1. The effective vibratory area of tympanic membrane is only 2/3; the effective areal ratio is reduced to 14:1. **[Hydraulic Action of tympanic membrane]**

Tympanic membrane perforation is mostly due to infection, trauma or Post Tympanostomy tube insertion. In the spontaneous healing phenomenon of tympanic membrane perforation, there is a continuous centrifugal migration of the outer squamous epithelial layer; it is missing supportive matrix under the regenerating epithelial layer of a perforation, preventing the influx of reparative cells and nutrients into the area of healing. We use the fat graft as a support for epithelial cell migration.

Posteroinferior quadrant seems to be more vulnerable to the trauma since it is more laterally placed and more easily accessible. Direct trauma is more likely to damage the posteroinferior quadrant. During slap the pressure wave travels along the posterior canal wall and strikes the posteroinferior quadrant first thereby creating a perforation there.

In acute otitis media histological degeneration of the tympanic membrane occurs in the outer and inner fibrous layers of the lamina propria and in the sub mucosal layer. These changes may reduce the elastic properties of the tympanic membrane, making it more susceptible to chronic perforation or retraction.

When those tympanic membrane perforations are small and persistent, the hearing reduction is usually mild but the middle ear mucosa is exposed in this condition to the external environment by the defect of ear drum. Through this defect: water, sweat, discharge of the external ear canal if infected or even variation in external temperature, can reach directly the middle and inner ears causing infection or damage and progressive hearing loss.

Prophylactic antibiotics do not influence closure rate. Successful closure of the tympanic membrane usually gives only a small improvement in hearing.

An aerated middle ear is necessary for middle ear function. A functioning Eustachian tube is necessary for an aerated middle ear.

In Traumatic perforation of tympanic membrane the most common presenting complaint was hearing loss. Most common cause for the perforation was due to slap injury. Majority of the patients had single grade I perforation. Majority of patients presented with conductive hearing loss in the range of 26-35dB.

Majority of the traumatic perforations of the tympanic membrane was noted in the left ear. Posteroinferior quadrant was found to be affected most commonly. Most of the perforations were having ragged margins. Infected ears took more time for complete healing compared to the uninfected. [35]

The middle ear effusion is evidenced by the visible retraction and change in color of the tympanic membrane and its immobility on pneumatic otoscopy. Scarring of the tympanic membrane and tympanosclerosis are often evident with previous recurrent infection or effusion.

FAT GRAFT:

There are two histological theories of fat grafts. 'The host cell replacement theory' of Neuhof⁴⁰ and 'The cell survival theory' of Peer⁴¹

1). The host cell replacement theory states that all the original cells die and are totally replaced by new wandering adipocytes or by fibroblasts.

2). The cell survival theory states that not all the original adipose cells die. Those fat cells which receive adequate blood supply survive whereas remaining degenerate, thus explaining loss of volume. The transplanted fat cells are not replaced by scar tissue; instead a connective tissue capsule outside the fat graft begins three weeks after transplantation, which becomes progressively thinner over the course of a year. Fat tissue provides the basic requirement for the grafting of the tympanic membrane with its own favorable characteristics.

Fat is also an active material containing angiogenic and survival factors e.g. Monobutylin, prostaglandins, interleukins 1 and 6, cytokines and tumor necrosis factor which, stimulate restoration and repair of the fibrous layer and promote revascularization which are both essential for survival of the free flap.

Fat graft promotes growth factors including vascular endothelial growth factor, transforming growth factor beta, platelet derived growth factor and fibroblast growth factor which promote the process of the tissue repair.

Fat contains high population of multipotent cells referred as adipose-derived stem cells which are similar in activity to those of the bone marrow derived mesenchymal stem cells in the ability to differentiate into mesenchymal tissues such as endothelial and fibrous types promoting the healing process of the tympanic membrane.

Ear lobule fat can be harvested from the same sterile area of surgical field prepared for the fat Myringoplasty. Its scar is almost invisible as incision is given on the posterior aspect of lobule. The fat of ear lobule is denser and has better epithelial and mucosal tympanic growth.

Surgical approaches:

Myringoplasty is one of the frequently undertaken procedures for the treatment of chronic suppurative otitis media. The procedure can be performed in 3 different ways, viz., post aural approach, end aural approach, and endomeatal approach with use of operating microscope.

Endoscopic approach to the middle ear is a recent concept and it is minimally invasive. Otoendoscope has advantages of better visualization of the middle ear structures and greater degree of freedom in negotiating the external auditory canal bulges. It has been successfully used in reconstruction of small to medium sized perforation.

Initially otoendoscope was used as a diagnostic tool to closely inspect the tympanic membrane and the middle ear structures. First use of the endoscope was done in the year 1967 by Mer *et al.* to examine the middle ear. Later on with the advent of rigid Hopkins rod telescopes, otoendoscopes are now routinely used for the examination of the intact tympanic membrane and its abnormalities and middle ear surgeries.

There are basically 3 approaches to visualize the tympanic membrane, post aural, end aural, and transcanal. Of all these approaches used by the microscope, post aural and end aural approaches usually make an external incision and leave a scar and post operative morbidity. Further, in selected cases with wide and straight external auditory canal the transcanal approach rendered no external scar and minimal morbidity post operatively. Otoendoscope made this approach more popular in treatment of small central perforations with close inspection of the middle ear structures. In the literature, there are various graft materials that have been used for this method of transcanal endoscopic reconstruction of the tympanic membrane with small central perforation.¹⁹

The different techniques used include overlay, underlay, sandwich, pegging, rosette, and plugging, the former two being the most popularly used. In 1962, Ringer berg²⁸ and Fornatto used earlobe fat as a graft material for Myringoplasty. Transcanal technique is minimally invasive and has several advantages such as decreased surgical time, ease of learning, comfort to the patient, no hair shaving, no bandage, minimum medication, no complications of the post aural wound and no need for hospitalization.

REVIEW OF LITERATURE

The first recorded attempt at Myringoplasty was by Marcus Banzer⁴² in 1640, who tried to repair the tympanic membrane perforation by using a small ivory tube. The first successful surgical closure using auto graft with a full thickness free skin graft was performed by Berthold⁴³ in 1878 and he introduced the word “Myringoplasty”.

Warmald, has defined the surgical closure of the tympanic membrane perforation without ossicular reconstruction as Myringoplasty

As the repair of TM by Berthold’s method caused recurrent perforations and cholesteatoma, different graft materials were tested by various surgeons to overcome the obstacles of this method. First by Hagerman in 1958 and later by Ortegen in 1959, the autologous temporalis muscle fascia had been introduced as the ultimate graft material for tympanoplasty, and since then, this graft is the most popular grafting material in otological surgery.

A variety of auto grafts, allograft, xenografts, and alloplasts (temporalis fascia, tragal perichondrium, bovine pericardium, etc) have been used for Myringoplasty.

Temporalis fascia graft has the following advantages, ease of harvest, abundant availability, even in revision cases, via same post auricular incision, resistant to infection, has low basal metabolic rate brightening its success rate and its thickness is more or less similar to that of tympanic membrane.

The Fat Graft Myringoplasty was 1st introduced by Ringer berg²⁸ in 1962 as an Office based Procedure for adult patients. Ear lobule fat graft was used and introduced this method as a simple, reliable and cost effective procedure for small TM perforations. However, his operational technique was very different from the one that is used nowadays. He elevated the tympanomeatal flap, explored the middle ear and placed the graft lateral to the perforation, but not through the perforation in the dumbbell fashion as introduced by Althaus¹ as we mostly use today and also used in our study.

In 1964, Sterker⁴⁷ used compressed abdominal fat for tympanic membrane closure and since then, various studies have been reported in the literature using both ear lobe and abdominal adipose tissue for Fat Myringoplasty in children and in adults.

Ayache et al², harvested fat from the abdomen, making a separate skin incision close to the center of the umbilicus, in 91% of the cases and from the pretragal area in 9% of the cases.

Deddens et al⁸ in 1993 had reported that the size of tympanic membrane perforation was a crucial factor in fat Myringoplasty

Mitchell²⁴ 1997, described the use of fat as a graft for Myringoplasty in 342 children to close small tympanic membrane perforation with success rate of 92%.

Saliba et al recorded 17 dB as a mean improvement of air/bone gap in his study; Liew et al²¹, recorded improvement in 11 of their 15 patients; Hagemann and Housler¹⁴, showed improvement in 21 of their 44 patients. Fiorino and Barbieri¹¹ recorded a slight non significant improvement in their 31 patients.

Shih *et al.* reported a success rate of 54% for children of 10 years and younger compared to 94% for children over 11 years of age. Friedberg and Gillis concluded that age is a significant factor in determining the success of FM, but favored the younger patient. There were no graft failures under 11 years of age in their series.

Chandrasekhar *et al.* did not detect any magical age at which the success rate of TM repair improves and found no statistical difference in the three age groups studied 0-8, 9-12 and 13-19 years. These conflicting results clearly demonstrate that age alone cannot predict the success or failure of FM.

Monoj Mukherjee *et al.*²³ described this procedure as minimyringoplasty with high success rate (92%) for repair of small size perforations.

A prospective clinical study by Hassan Moustafa Hegazy *et al.*, showed successful closure (89%) for post-Tympanostomy tube extraction persistent perforations, (90%) for post traumatic persistent perforations and (86.6%) for each of chronic tubotympanic inactive suppurative otitis media with perforation and post Myringoplasty residual perforation.

In the study by I.Konstantinidis et al¹⁷, Adipose tissue is a satisfactory graft for the tympanic membrane. Myringosclerosis was not an important factor for the success of the operation and should not be considered as a contraindication.

Fat plug Myringoplasty by Vikas Sinha et al⁴⁸, showed success rate is as good as tympanoplasty using temporalis fascia.

Dr, B.C Patil et al concluded that fat graft Myringoplasty has excellent results with respect to graft uptake and hearing improvement in cases of small central perforation (less than 25% of pars tensa).

A review of the literature revealed that in studies of Fat Myringoplasty in human subjects, the clinical materials, the cause and size of the perforation, and the origin of the fat used varied extensively. Fat from the patient's ear lobe is usually used, although Ayache² and colleagues harvested the fat graft from the abdomen or the pretragal area, and De³⁶ and colleagues used fat from the area between the tragal and helical cartilages. Some authors have also stressed the cost-effectiveness of performing Fat Myringoplasty as an office procedure.

The fat graft tissue Myringoplasty has certain advantages as this procedure can be done in an office basis or on an outpatient basis. The patient goes home on the same day. There is very limited postoperative care. Fat can be harvested in a very short time and it avoids invasive extensive surgical manipulation of the middle ear. It avoids general anesthesia and is very safe for a dry, small, central perforation. It is a simple and cost effective technique in managing small tympanic membrane perforation and the success rate of a fat-plug Myringoplasty is comparable with the results of temporalis fascia tympanoplasty.

Healing of perforation is completed within 2 - 3 months. Healing occurs by epithelialization over the scaffolding of fat graft. But fat graft itself takes longer time for complete resumption to occur.

It is evident that an attempted closure of a medium or larger sized perforation may early lead to failure simply because too large a piece of fatty tissue is used. It will protrude into the tympanic cavity, causing partial obliteration or into the ear canal causing problem with reepithelialization. So fat is therefore restricted to use for small perforation.

AIMS AND OBJECTIVES

To evaluate the efficacy of the Fat Graft Myringoplasty with respect

- To find out the success rate of closure of small dry central TM perforation / Graft uptake,
- To compare the success rate of Fat Myringoplasty harvesting fat graft from different donor site (Ear lobule / Abdominal fat),
- To assess the operative outcome in correlation with site of perforation,
- To evaluate as Day Care Procedure,
- To find out the incidence of the complications if any.

MATERIALS AND METHODS

A Prospective Cohort Clinical study was carried out at Department of Otorhinolaryngology, Govt.Rajaji Hospital – Madurai.

Time period of this study is 1 year, from August 1, 2016 to July 31, 2017. All patients between the age groups of 18-50 years attending to the ENT O.P.D. with complaints of ear discharge and deafness were screened by detailed history, clinical examination and otoendoscopy.

Forty patients were selected according to these following criteria:

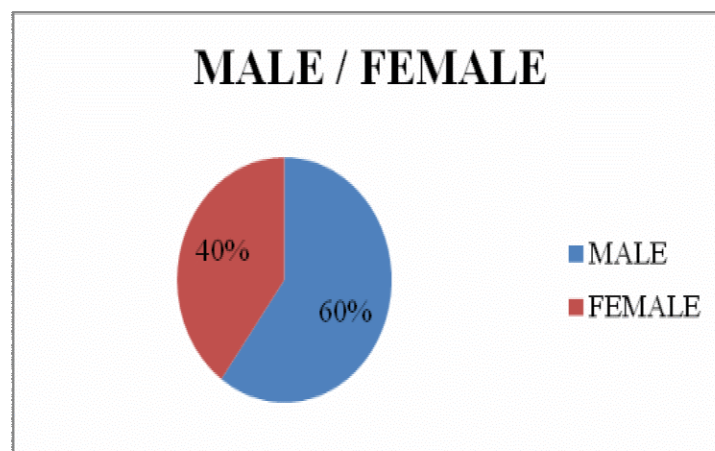
CSOM with central perforation not exceeding 25% area of Pars tensa of TM.
Dry perforation for at least 6-8 weeks
Perforation persistent for at least 6 months
Age : 18 – 50 years
Normal appearance of middle ear mucosa
PTA showing Conductive hearing loss with Air Bone gap \leq 30 dB

Small central perforation is confined to one quadrant or < 25% of Pars tensa of Tympanic membrane:

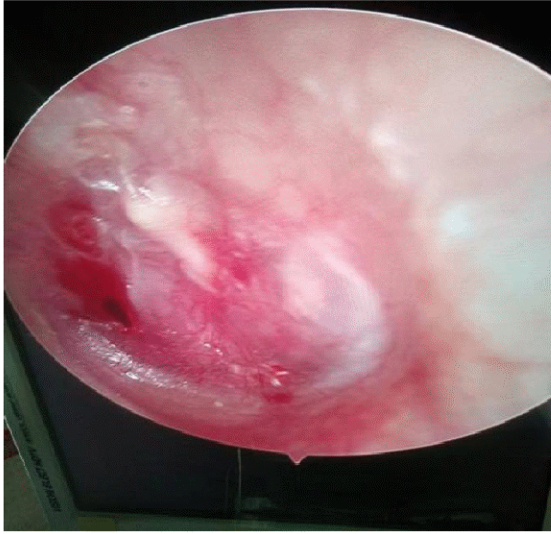
Patient who had active ear discharge, history of previous ear surgery, with associated significant pathology in Middle ear cavity (Cholesteatoma, Ossicular pathology, retraction), Tympanic membrane with Tympanosclerosis, Atrophic area or Pars flaccida retraction, marginal perforation, Sinusitis / History of Allergy or uncontrolled Systemic diseases were excluded from this study.

This study included 40 patients (24 males and 16 females) [Picture – 3] with a small dry central perforation of tympanic membrane that resulted from any of the following causes (infection, trauma or post Tympanostomy tube insertion).

Picture - 3



The approval of the Institutional review board was obtained.



Picture showing a small central perforation in the anterior quadrant of tympanic membrane

Picture - 4

Preoperative evaluation by

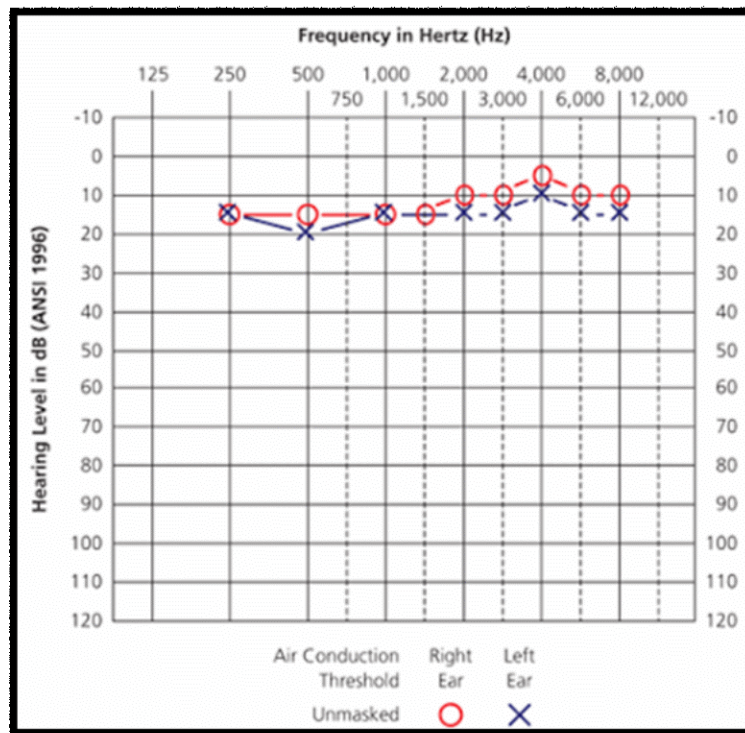
- **Otoendoscopic examination** of central perforation - site, shape, margin, middle ear mucosal status.
 - According to site of perforation – Anterior, Posterior, Central
- **Pure tone audiogram** - to rule out (COHL / SNHL) (ossicular pathology)
- **CT scan temporal bone** – any associated middle ear / mastoid bone pathology

➤ **Diagnostic Nasal Endoscopic Examination** to rule out Rhino sinusitis

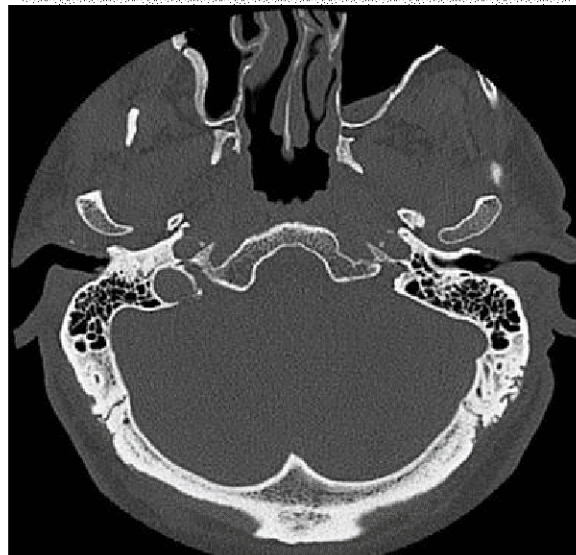
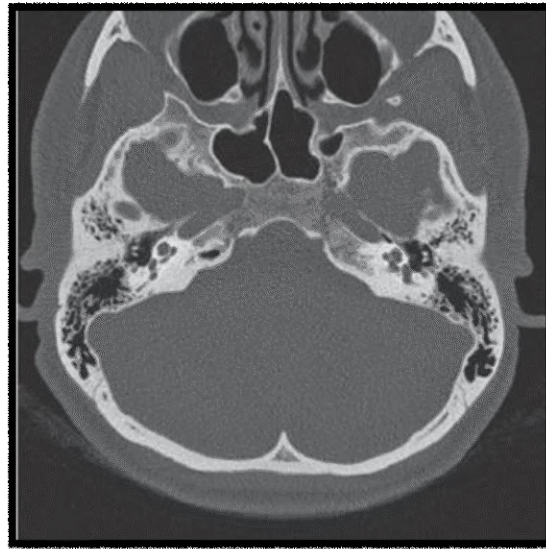
➤ **Basic investigation for assessment for surgery.**

(Basic investigations viz. Hb%, TC, DC, BT, CT, HIV, Hb-SAg etc. were done.)

Picture – 5 showing Pure Tone Audiogram



Picture -6 showing normal CT Temporal bone



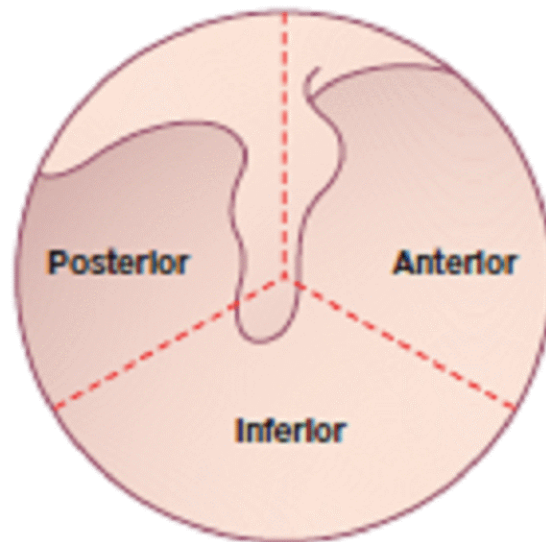
STUDY GROUP

Site of perforation -

Group a – Anterior (6)

Group B – Posterior (14)

Group C- Central (20) / Inferior



Picture - 7

Site of fat harvesting –

Group I - Ear lobule fat [28]

Group II - Abdominal fat [12]

Operation time

Total operation time

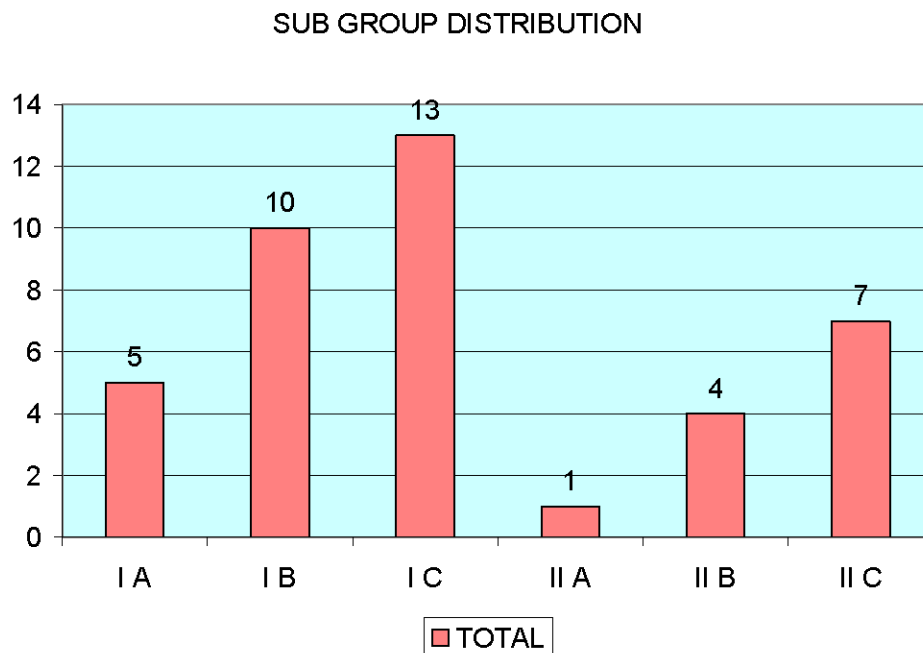
Surgical operation time

Total operating time was the time that the patient stayed in the operation theatre. Surgical operating time was the time from starting of the local infiltration till the end of surgical procedure.

TABLE – 1 SUBGROUPS

Donor site Vs perforation site	Anterior	Posterior	Central/inferior
ear lobule fat	IA	IB	IC
abdominal fat	IIA	IIB	IIC

CHART - 1



The detail procedure was explained in the vernacular language and those patients willing to give written consent underwent fat graft Myringoplasty. All cases were operated under local anesthesia with prior prophylactic oral antibiotic medication.

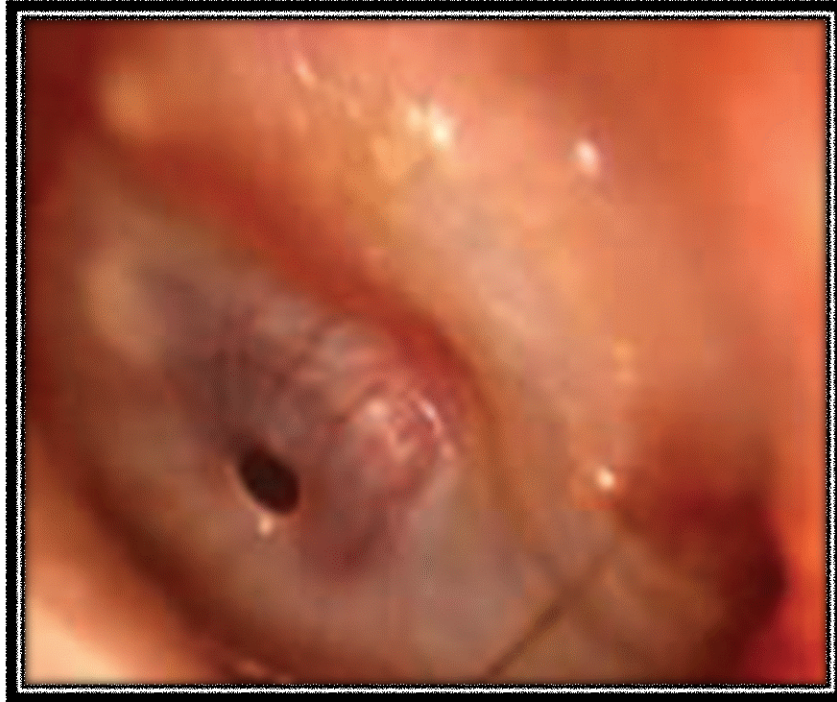
Patients were discharged on the same day. They received oral antibiotics for six days along with antihistamines.

SURGICAL PROCEDURE:

Picture - 8 showing Hopkins rod endoscope



Under strict antiseptic precaution all the cases were operated under local anesthesia. Patient in standard otosurgical position [lignocaine 1-2% with Adrenaline 1: 2, 00,000] by Transcanal / Endomeatal technique, with Endoscopic guidance – 0 degree 4 mm Hopkins rod.[Picture – 8]



Picture – 9 showing Tympanic membrane with small central perforation

The Osseo-cartilaginous junction of the external ear canal was infiltrated with 2% xylocaine with 1 in 2,00,000 adrenaline. The ear lobule was also infiltrated in the posterior aspect.

Fat graft from ear lobule: after giving local anesthetic infiltration small (10 – 15 mm) incision made along the edge of ear lobule and fat tissue was harvested.



Harvesting
ear lobule
fat

Picture - 10

Abdominal fat- taken from infra umbilical region i.e. 1 cm below umbilicus- A 2cm horizontal incision was made and fat graft was harvested under local anesthesia.



Harvesting
abdominal
fat

Picture - 11

Freshening of edges of the perforation with Rosen needle {puncture circumferentially along the edge of the perforation followed by removal of thin rim of edge of the perforation by middle ear cup forceps}. Take care that all the squamous is cleared from the edge. The size of the freshened central perforation is estimated by using right angled ear pick.

The size of the fat graft should be more than double the size of freshened perforation.

Picture - 12



Fat graft
placement

The middle ear was then packed with a single piece of gel foam. The fat graft was inserted through the perforation in a **Dumb bell shaped** or Hour glass fashion. So that it covered both sides of the margins and snugly fit into the perforation.

The fat graft was thus positioned so that it fills the depth of the middle ear with a small part lateral to the tympanic membrane. The graft was supported with tiny gel foam pledges soaked in antibiotic solution.

Picture -13



FAT GRAFT PLACEMENT

While plugging the fat take care that the graft didn't contact with medial wall of tympanic cavity or ossicles. Medicated gel foam kept in external auditory canal.

The lateral fat bulge should not be too high to help epithelial closure of the perforation. Oversized fat plug may cause a tear in the tympanic membrane or overstretching of the perforation margins leading to atrophy or necrosis later on. Undersized fat plug should be avoided to prevent dehiscence in grafting.

After recovery from anesthesia, the patient was discharged on the same day with home medications comprising proper antibiotics, analgesics and nasal decongestant spray for one week. The patient was instructed to keep the ear dry, avoid straining or nose blowing for at least 4 weeks. The merocel pack was removed after 1 week and the gel foam was removed at the end of the 3rd week. Local antibiotic drops were prescribed for 2 weeks after removal gel foam. Follow up visits, for the tympanic membrane evaluation were performed.

POST OPERATIVE FOLLOWUP

❖ Regular follow up at least for 6 months

(in the 1st month weekly, bi weekly in 2nd month, third month onwards monthly follows up)

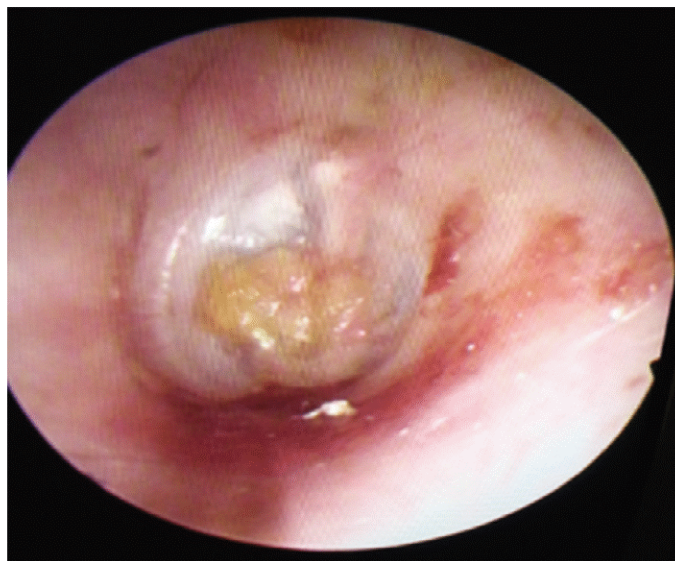
POST OPERATIVE SUCCESS RATE assessed by

- 1) Graft uptake by Otoendoscopic examination after 8th week.
- 2) Pure Tone Audiogram at 8th week (hearing improvement in the form

of closure of the air-bone gap)

- 3) Time taken for surgery and recovery
- 4) Complications of the procedure if any

Picture – 14: FAT GRAFT INSITU



OBSERVATION

The prospective cohort clinical study was carried out on 40 patients attending ENT OPD, Govt.Rajaji hospital, Madurai in the period of one year from August 1, 2016 to July 31, 2017.

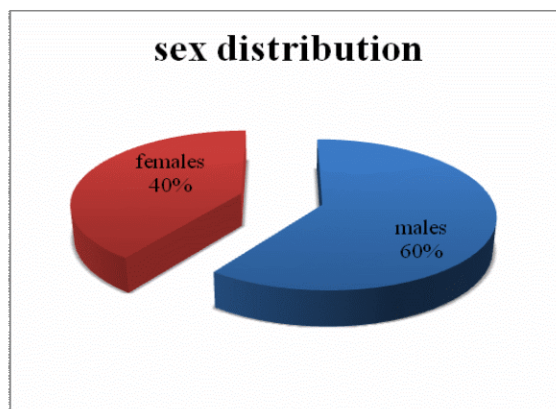
The ages of the patients ranged from 18 to 50 years with mean age of 32.05 ± 8.34 years

The minimum age in the study was 19 years, and the maximum age was 47 years.

The maximum numbers of patients were found in the age group of 26 to 35 years.

There were 24 male (60%) and 16 female (40%) patients showing male preponderance with male to female ratio of 1.5: 1.

[picture16]

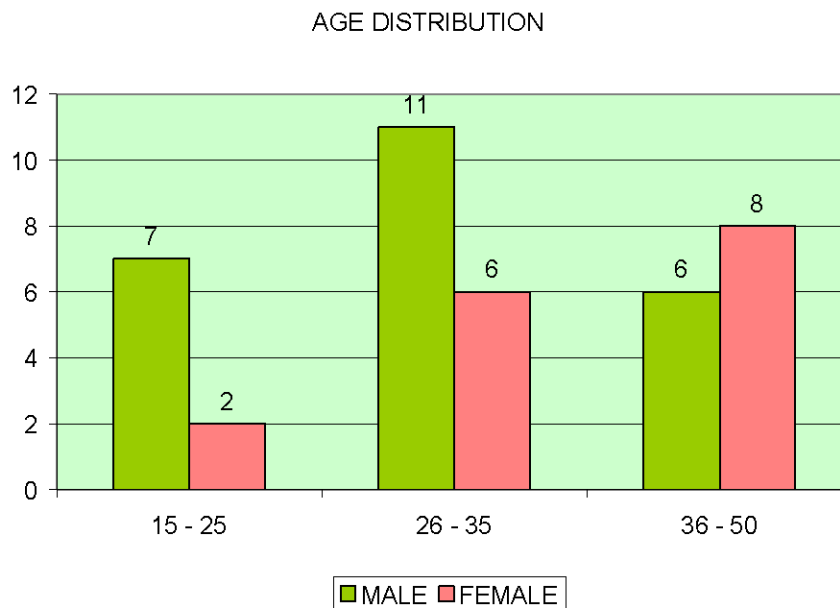


Picture - 16

AGE AND SEX WISE DISTRIBUTION OF CASES: [Table – 2]

AGE	MALE	FEMALE	TOTAL
15 - 25	7	2	9
26 - 35	11	6	17
36 - 50	6	8	14
Total	24	16	40

Chart - 2



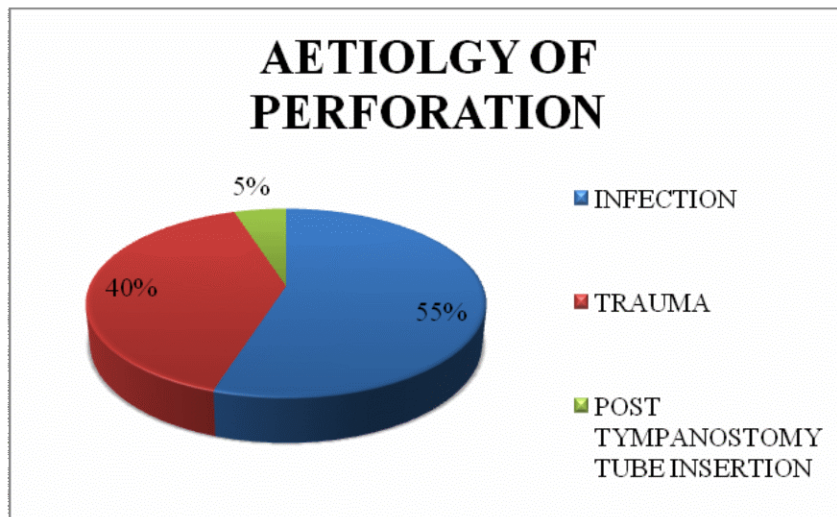
All the patients had complaint of ear discharge and associated with hard of hearing and / or ear pain.

AETIOLOGY OF PERFOERATION: Table - 3

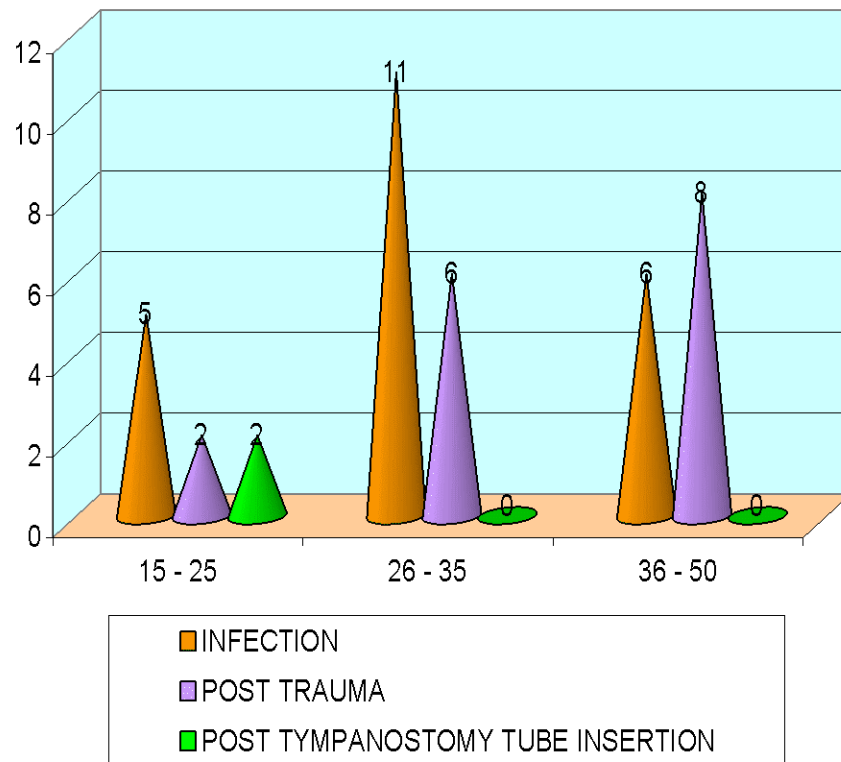
AGE	INFECTION	POST TRAUMA	POST TYMPANOSTOMY TUBE INSERTION
15 - 25	5	2	2
26 - 35	11	6	0
36 - 50	6	8	0
TOTAL	22	16	2

Out of 40 patients, 22 patients (55%) had infectious etiology, 16 patients (40%) had traumatic cause and 2 patients (5%) had post Tympanostomy tube insertion as a cause. Infection was the most common cause followed by trauma.

Chart - 3



AGE VS COMPLICATIONS



According to site of perforation, 20 patients (50%) had central perforation, 14 cases (35%) had posterior perforation and anterior perforation seen in 6 patients (15%). Inferior or central perforation was the most common cause in our study.

Table - 4

SITE OF PERFORATION	GROUP
ANTERIOR PERFORATION	A
POSTERIOR PERFORATION	B
CENTRAL PERFORATION	C

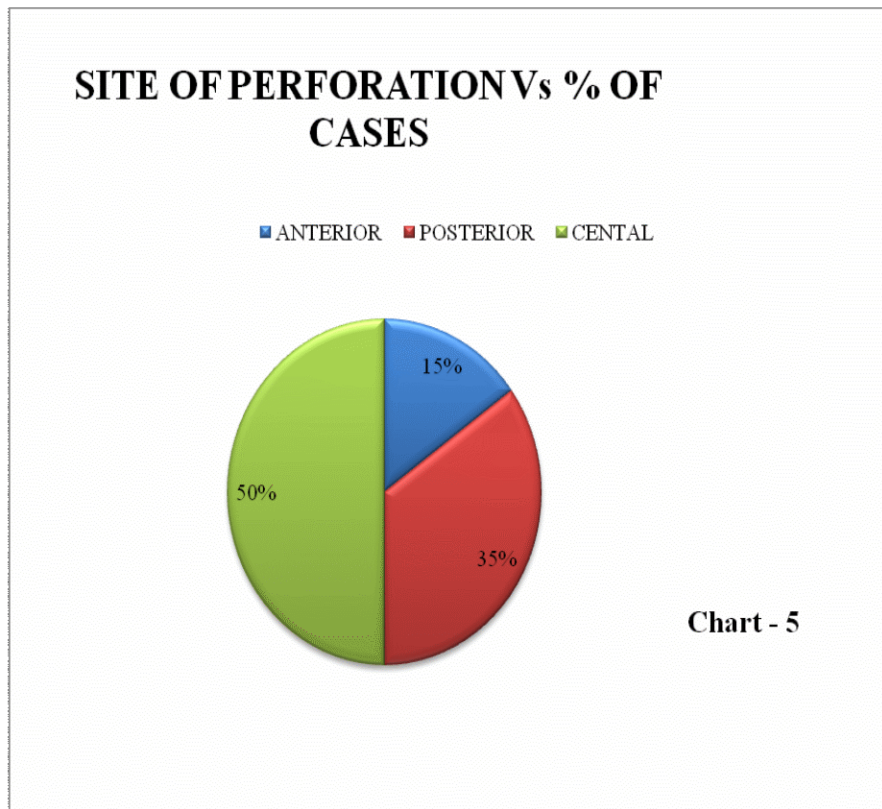


Chart - 6 AGE VS TYPES OF PERFORATION

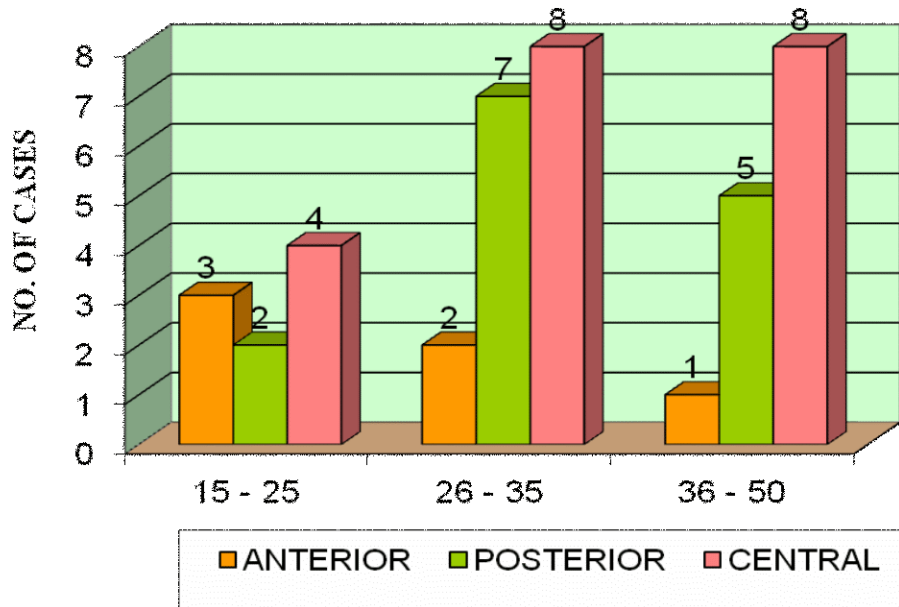


TABLE -5

AGE	ANTERIOR	POSTERIOR	CENTRAL
15 - 25	3	2	4
26 - 35	2	7	8
36 - 50	1	5	8
Total	6	14	20

Diagnostic nasal endoscopic examination and CT scan temporal bone were normal for all the subjects in this study.

TABLE – 6

EAR LOBULE FAT	I
ABDOMINAL FAT	II

Out of 40 cases, ear lobule fat was used as graft in 28 patients (70%) and abdominal fat in 12 patients (30%).

CHART – 7

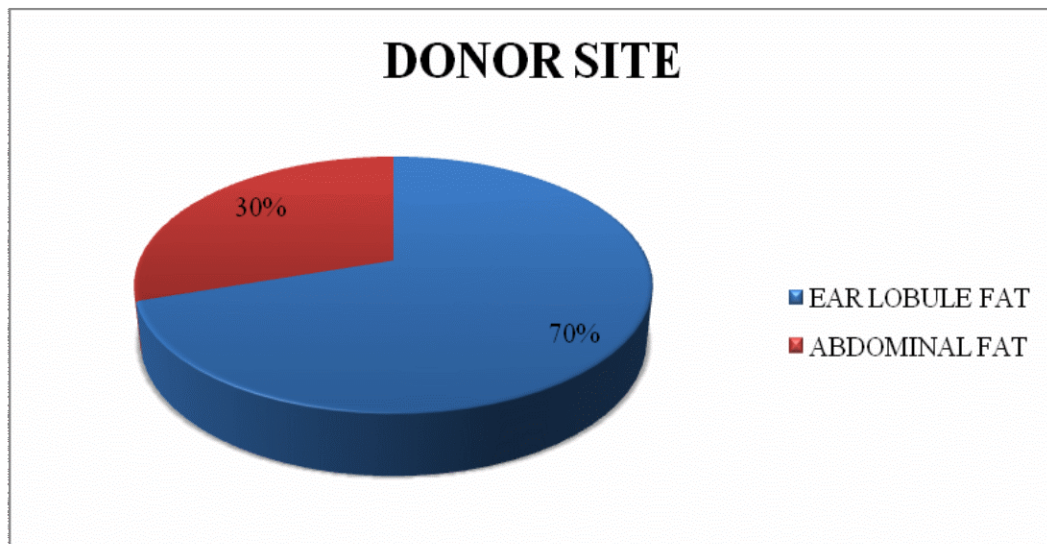
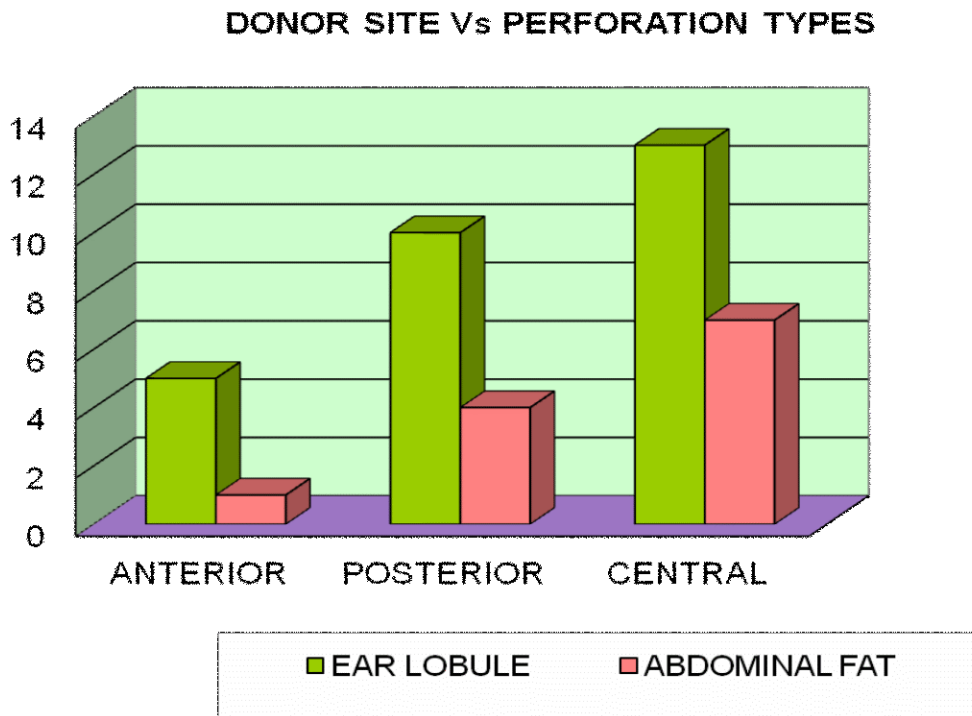


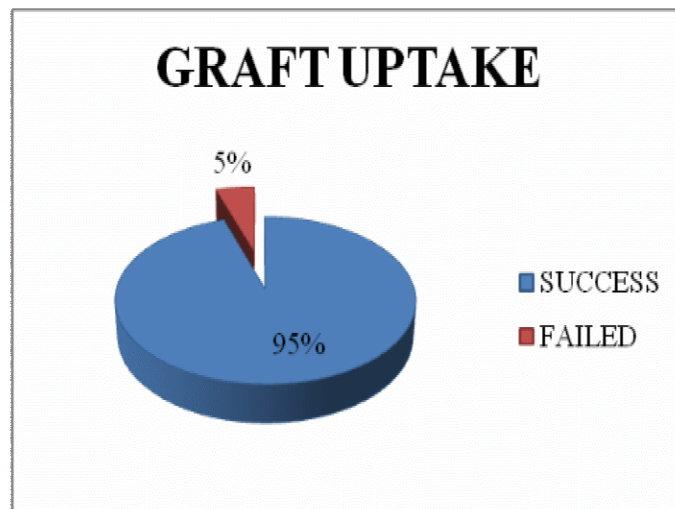
CHART-8



GRAFT UPTAKE:

Our study had successful graft uptake in 38 patients out of 40 patients and this was 95%.

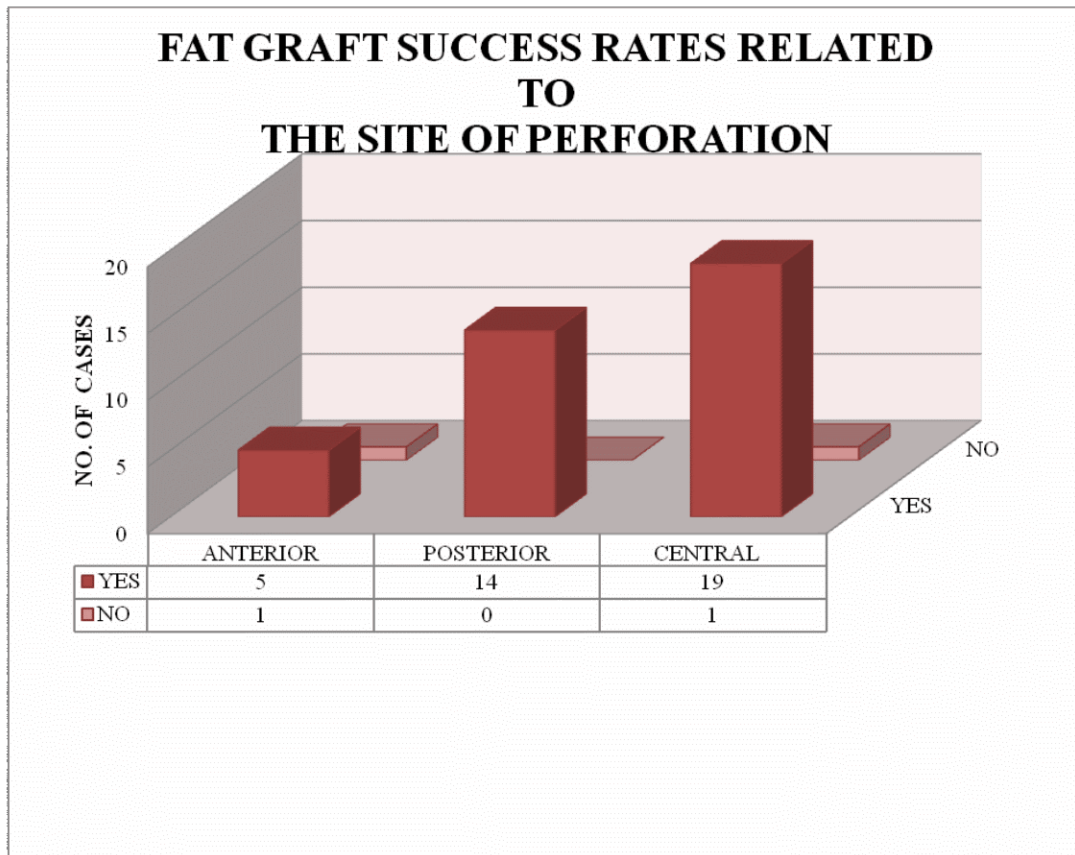
CHART - 9



There were 23 males (95.8%) and 15 females (93.75%) in the successful graft group and there were 1 male and 1 female in the unsuccessful graft group. The difference between gender groups was statistically not significant. (P value- 0.657)

The graft uptake with respect to site of perforation was as follow higher in posterior perforation (100%) while central perforation had closure rate of 95% and 83.3% in anterior perforation. The different was statistically not significant. P value > 0.05

CHART10



When we classified patients according to site of perforation as anterior, posterior and central and analyzed its relationship with successful closure rates, in posterior perforation the closure rate was 100%, in central perforation was 95% and finally in anterior perforation the closure rate was 83.3%. The difference was statistically not significant.

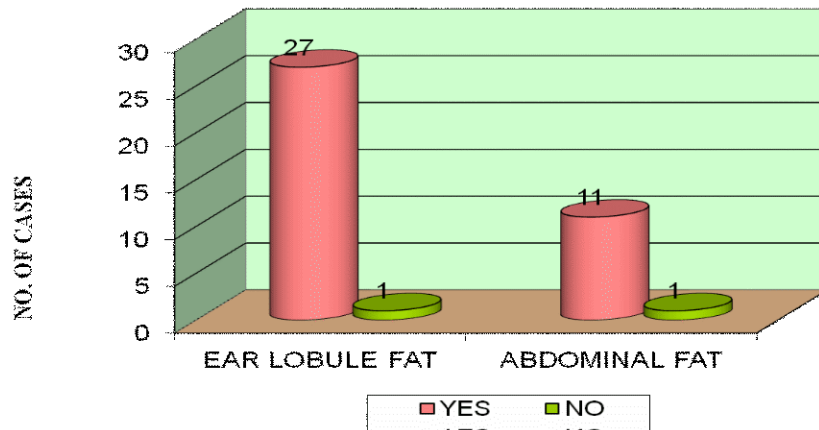
In the evaluation of the effect of graft materials from different donor site on tympanic membrane closure, we studied, of the 28 ear lobule fat graft patients, 27 patients had successful closure and 1 had unsuccessful closure.

TABLE - 7

DONOR SITE	SUCCESSFUL UPTAKE	FAILED CASES
EAR LOBULE FAT	27	1
ABDOMINAL FAT	11	1
Total	38	2

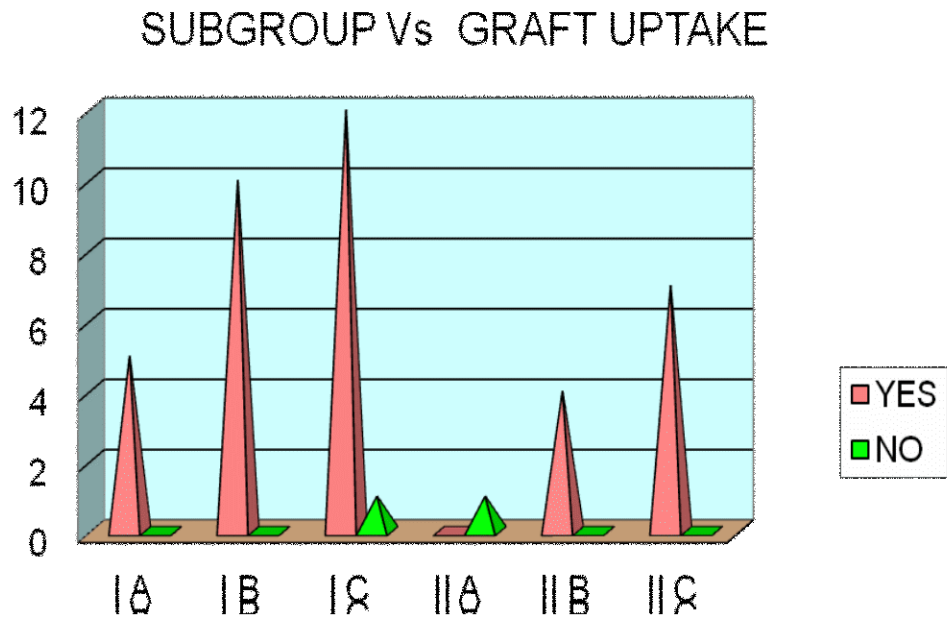
CHART - 11

FAT GRAFT SUCCESS RATES RELATED TO DONOR SITES



Of the 12 abdominal fat graft patients, successful closure seen in 11 patients and one had residual perforation. In both groups, there was no significant difference between graft sources.

CHART - 12



The mean Total operation time was 42.87minutes with standard deviation of 5.65min. The mean surgical operation time with standard deviation was 23.00 +/- 5.04.

CHART - 13

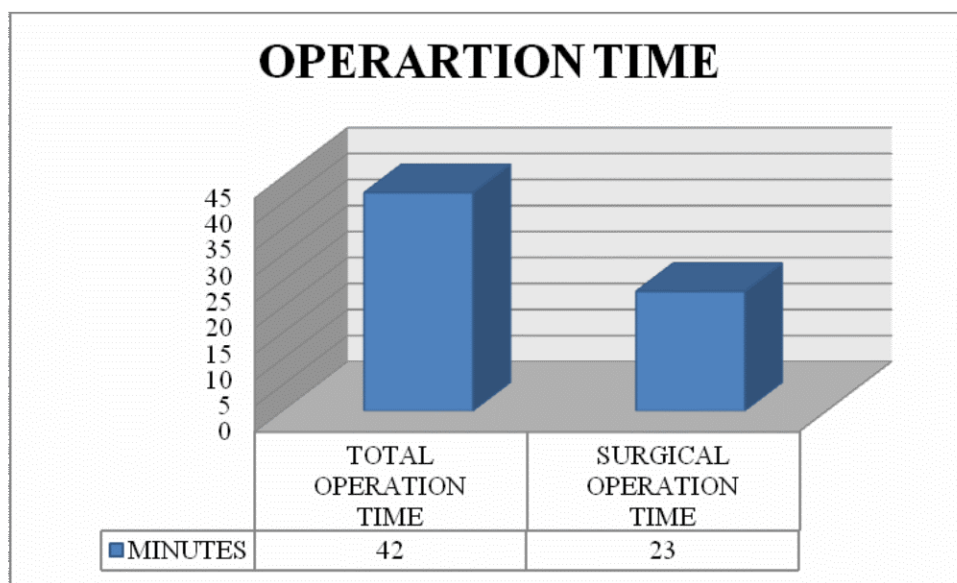
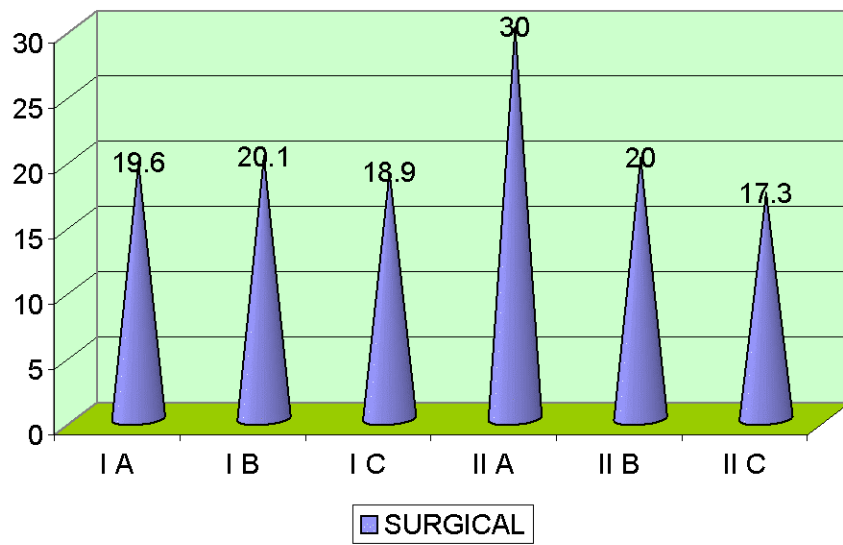


TABLE - 8

Donor site	Mean total operation time with SD	Mean surgical operation time with SD
Ear lobule fat	39.82 +/- 3.19	20.36 +/- 2.69
Abdominal fat	50.00 +/- 3.02	29.36 +/- 3.59

The time taken for the harvesting of the abdominal fat was more than ear lobule fat.

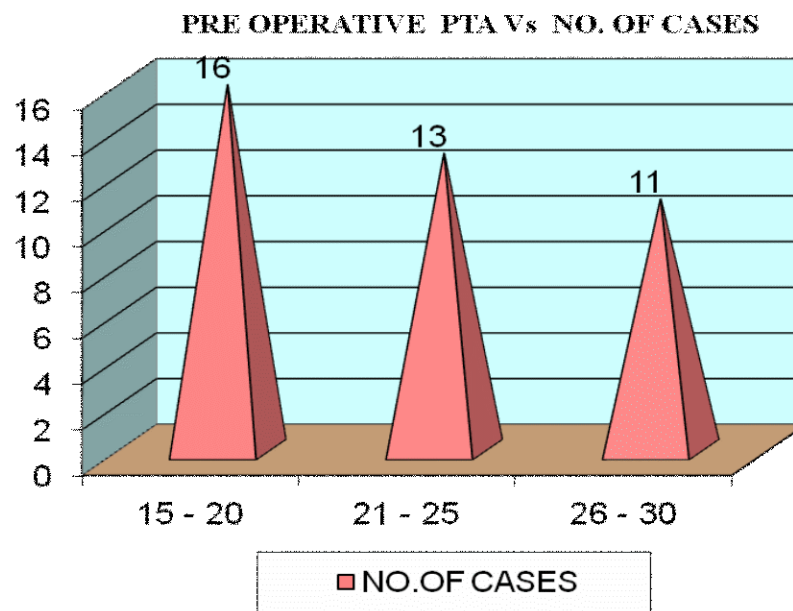
SURGICAL OPERATION TIME AND SUB GROUP



Out of 40 cases the preoperative PTA showed 16 cases had hearing threshold between 15 – 20 dB, 13 cases had 21 – 25dB and 11 cases had 26 – 30 dB hearing threshold. The mean preoperative PTA average was 22.2 dB.

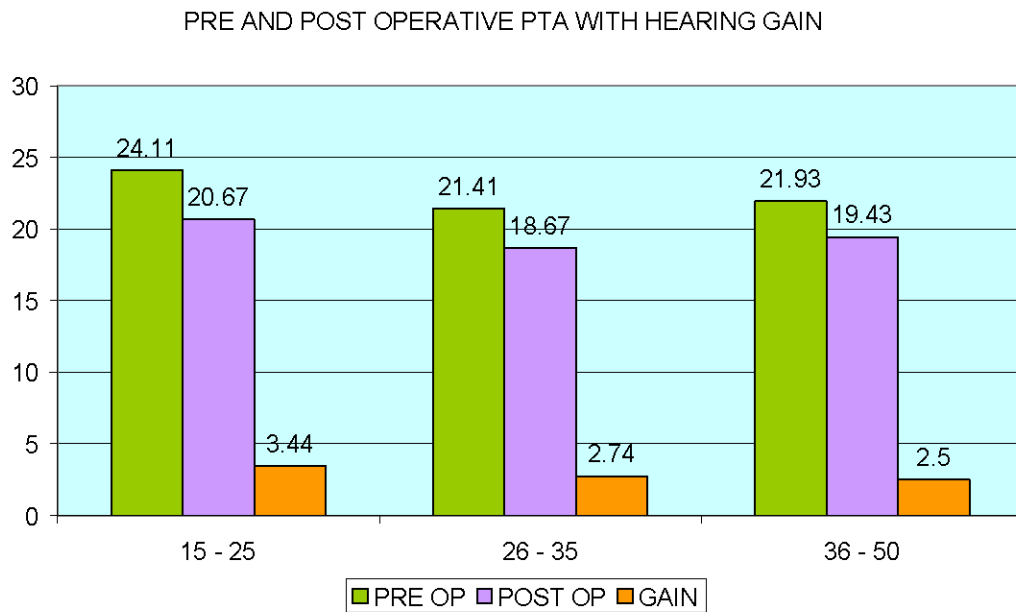
Post operative hearing gain is 2.89Db.

CHART - 15



In our study we found, the mean preoperative hearing threshold (dB) was 22.2 dB and after procedure the mean hearing threshold (dB) was 19.4 and there was a mean gain of 2.89 db which was statistically significant. (P value is 0.009)

CHART - 16

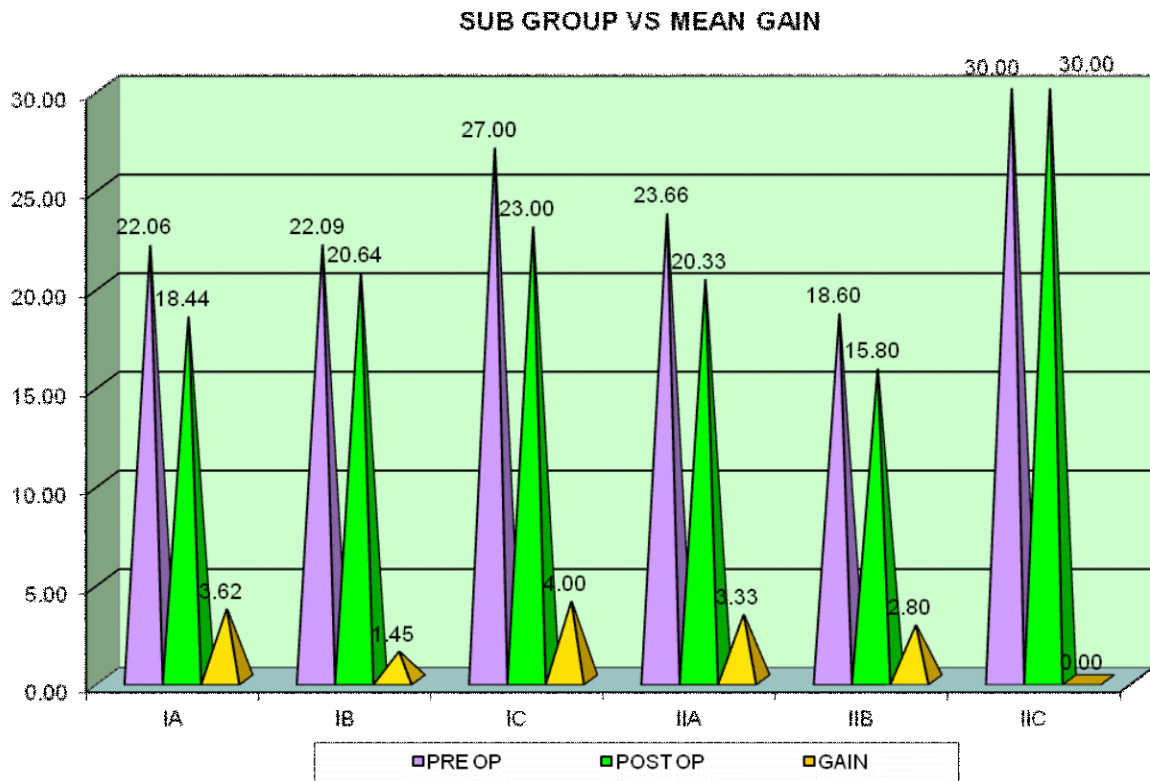


In the age group of 15 to 25 years, the mean preoperative PTA was 24.11dB, the mean postoperative PTA was 20.67dB and the mean gain was 3.44.

In 26 to 35 years age group, the mean preoperative PTA was 21.47dB, the mean postoperative PTA was 18.67dB and the mean gain was 2.74.

In the age group of 36 to 50 years, the mean preoperative PTA was 21.93dB, the mean postoperative PTA was 19.43dB and the mean gain was 2.5dB.

CHART - 17



Out of 40 cases complications took place in 2 cases (5%).

One had residual perforation and other one had infection.

The patient who had residual perforation, didn't come for follow up in the first postoperative month.

With regard to site of perforation, One failure case seen in central perforation and one in anterior perforation.

On the basis of etiology one failure case in infective etiology and one in post Tympanostomy tube insertion case.

According to site of fat graft harvested one failure case in Ear lobule fat and one in abdominal fat graft.

TABLE - 9

SUB GROUPS	RESIDUAL PERFORATION	INFECTION
IA	0	0
IB	0	0
IC	0	1
IIA	1	0
IIB	0	0
IIC	0	0

In our study 1 case had active ear discharge on 1st follow up due to Acute Otitis Media, discharge was stopped with conservative management but finally ended up with residual perforation, and they were advised tympanoplasty.

One other case had residual perforation which was surgically managed by type I tympanoplasty.

The perforation size did not increase after surgery in any of our subjects, including those in whom the perforation remained open.

DISCUSSION

The present study was prospective clinical cohort study. It was carried out to evaluate the efficacy of the Fat Graft Myringoplasty with respect to its success rate of small perforation of tympanic membrane in relation to site of perforation, site of fat graft harvested and as a day care procedure.

In the present study, the age of the patient varied between 18 - 50 years. In this age group there is less chance of upper respiratory infections and Presbycusis.

Michael and Glasscock et al⁴⁴ (1982) reported in their study that there is no difference in the take rate of graft based upon the age of the patient. In our study also there is no difference in the graft uptake in relation to age and sex of the patient.

In Traumatic perforation of tympanic membrane, Posteroinferior quadrant was found to be affected most commonly. Most of the perforations were having ragged margins. In our study 16 patients had post traumatic sequelae as a cause of tympanic membrane perforation.

Pure tone audiometry was one of the selection criteria in the present study. Cases selection was limited to an Air Bone Gap of no more than 30 dB to ensure free ossicular mobility in the studied ears as middle ear exploration is not attempted in the fat plug technique

The size of the perforation was determined by several parameters: the percentage of the pars tensa involved the number of involved quarters of the tympanic membrane, the diameter of the perforation, and the gross dimension of the perforation.

Poor results from the repair of an anterior perforation may occur because the anterior edge of the perforation is usually partially obscured by the bulging of the anterior ear canal. As a result, the scarred margin may not be adequately refreshed. In such cases, Ayache² and colleagues suggest the use of otoendoscopy for better visualization of the anterior margin.

Fiorino and Barbieri et al¹¹ study attributed the failure causes to: immediate failures due to technical difficulties such as anterior perforations, inadequate graft support, poor vascular supply or infection; and delayed failures due to tympanic membrane atrophy,

infections or Eustachian tube dysfunction with the change of tympanic membrane structure.

Halik¹⁵, Smith (1988), in their study, found higher risk of failure of graft in anteroinferior quadrant. Gian Antonio Bertoli et al⁵ in their study noted a low closure rate of anterior perforations (67.77%) compared to that of posterior perforations (90.5%). In our study the graft take up rate was lower for anterior perforations (83.3%), for posterior perforations the take up rate was 100%.

Endoscopic approach to the middle ear is a recent concept and it is minimally invasive. It has been successfully used in reconstruction of small to medium sized perforation.

Initially otoendoscope was used as a diagnostic tool to closely inspect the tympanic membrane and the middle ear structures. First use of the endoscope was done in the year 1967 by Mer *et al.* to examine the middle ear. Later on with the advent of rigid Hopkins rod telescopes, otoendoscopes are now routinely used for the examination of the intact tympanic membrane and its abnormalities and middle ear surgeries.

In our study we used endoscopes for pre operative evaluation, operative procedure and post operative follow up for graft uptake.

There are basically 3 approaches to visualize the tympanic membrane, post aural, end aural, and transcanal. Of all these approaches used by the microscope, post aural and end aural approaches usually make an external incision and leave a scar and post operative morbidity. Further, in selected cases with wide and straight external auditory canal the transcanal approach rendered no external scar and minimal morbidity post operatively. Otoendoscope made this approach more popular in treatment of small central perforations with close inspection of the middle ear structures. In the literature, there are various graft materials that have been used for this method of transcanal endoscopic reconstruction of the tympanic membrane with small central perforation.

The different techniques used include overlay, underlay, sandwich, pegging, rosette, and plugging, the former two being the most popularly used. In 1962, Ringer berg²⁸ and Fornatto used earlobe fat as a graft material for Myringoplasty.

Transcanal technique is minimally invasive and has several advantages such as decreased surgical time, ease of learning, comfort to the patient, no hair shaving, no bandage, minimum medication, no complications of the post aural wound, and no need for hospitalization.

Different managements are available for small size central perforations of tympanic membrane.

Chemical cautery of the margin of perforation can promote healing. This was showed by Derlacki⁹ with 90% success rate of closure of perforation after an average 3.7 treatments per patient. Here repeated attendance by the patient is required which is often not possible.

Conventional Myringoplasty with autologous temporalis fascia ha success rate of 100% for small perforation. But morbidity and cost of therapy is much higher for tympanoplasty.

Commonly used grafts include autologous temporalis fascia, perichondrium, cartilage and adipose tissue. Histologically, tympanic membrane grafts become lined by squamous epithelium on the ear canal side and middle ear mucosa on the tympanic cavity side.

The graft itself becomes the middle or connective tissue portion of the reconstructed drum, but the orderly arrangement of concentric and radial collagen fibers as seen in the normal drum is not reconstituted in the graft.

The size of the perforation is the main criterion used by many investigators to select candidates for FM. According to Kaddour³⁷, the size of the perforation should not exceed 30% of the size of the eardrum (closure rate, 80%). Terry³⁸ and colleagues, who performed FM to correct perforations of various sizes, cited a closure rate of 79.4% if the perforation accounted for less than 50% of tympanic membrane and 57.1% if the perforation was larger than that size.

Fat-plug Myringoplasty was first introduced by Ringerberg²⁸ in 1962 where he used fat from ear lobule as the major adipose donor site. He recommended this method for the closure of small perforations with a success rate of 86.5 %. Later, Gross et al. and Mitchell et al²⁴ popularized FPM in children especially for residual tympanic membrane perforations after tympanic tube extrusion.

Although Ringer berg²⁸ did not favor abdominal fat for grafting in his first studies, using only ear lobe as adipose donor site may have some disadvantages such as insufficient grafting material and cosmetic defects. In 1964, Sterkers⁴⁷ used compressed abdominal fat for TM closure and since then, various studies have been reported in the literature using both ear lobe and abdominal adipose tissue for FPM in children and in adults.

In the present study, fat was harvested from ear lobule. Microscopic comparison of fat from 3 sources (ear lobule, abdomen, buttocks) showed that fat cells from ear lobule were more compact and contains fibrous tissue. Hani GI Garem et al in their study of fat Myringoplasty using different types of fat noted the success rate for ear lobule fat was 80%, where as for abdominal fat was 73.3%.

A study by Gian Antonio Bertoli et al³⁹, suggested that guidelines for the harvesting of fat be followed. First, the fat must be harvested after the refreshment of the edges of the perforation. In a few patients, with a small ear lobe, the graft taken from the lobule club is too small because of the enlargement of the perforation.

In those individuals, it was necessary to harvest the fat from the abdomen, a procedure that may also be required in patients who wear earrings. They modeled the adipose tissue into an hourglass shape, although other clinicians have preferred a champagne-cork shape or a bell shape. In their experience, the shape of the adipose tissue is not of great importance, although obtaining a fat graft that is 2 or 3 times larger than the perforation is essential. In their opinion, the infiltration of an anesthetic could artificially enlarge the volume of fat tissue in the ear lobe.

The advantages of fat graft include: It does not need support from the middle ear side to prevent collapse like underlay grafts especially at the area near the anterior annulus.

Hagemann and Hausler¹⁴ noted closure of perforation in 91% of cases and hearing Gain of 5–10 dB. Chalishazar⁶ described closure of TM perforation in 90% cases by fat graft Myringoplasty.

Mitchel et al²⁴ described a review of 342 children who underwent fat graft Myringoplasty and achieved successful closure in 92% of ears.

Success rate in our study was 95%.

Technical operative points during fat grafting (such as graft size in the perforation, degree of lateral bulge of the fat plug and moistening of the lateral side of the graft) are also considered to be important factors of success in the fat grafting procedure.

In this study, of the 28 ear lobule fat graft patients, 27 patients had successful closure and 1 had unsuccessful closure and out of the 12 abdominal fat graft patients, successful closure seen in 11 patients and one had residual perforation. In both groups, there was no significant difference between graft sources. From this study, we should also consider the abdominal fat for repair of small dry central perforation of TM.

Fat graft presents a big revascularization activity as seen by otoscopy a few days after the procedure. There is significant bulging on the tympanic membrane till the end of the third month postoperatively and after three months bulging of the fat graft progressively disappeared and converted into a smooth sclerotic area on the tympanic membrane at the fifth month. This phenomenon was also seen in all our successful patients in the postoperative period of 1-3 months.

The Trans canal approach seems to be safer for the patient in comparison to the classic Myringoplasty techniques since no manipulations of the middle ear are performed and the related complications are avoided. Fat is not the only material used when the tympanic membrane is approached via the external auditory meatus but it is somewhat easy to harvest and handle.

Free fat grafts have been known to reduce in size during long-term follow up. This is the reason why the grafts used were approximately two times larger than the size of the perforation. Nishimura et al²⁵ observed in an experimental study that apoptotic cells were present 30 days after transplantation. On the other hand the weight of the graft was significantly lower 180 days later. A weight loss of 20-80% is mentioned in the literature in adipose tissue grafts. A bulging on the tympanic membrane is present even 1 month after the operation but in the 12th postoperative week the graft is smoothly integrated with the tympanic membrane.

Ringer berg²⁸ compared microscopically ear lobule fat, abdominal wall and buttock fat. The comparison showed that fat from ear lobule were found to be more compact and contain more fibrous

tissue than other donor sites. This should provide a strongest and denser scaffold to allow for greater retention of the graft during epithelialization.

However, Kwong et al⁴⁶ asserted that this feature of ear lobe fat may complicate angiogenesis and tissue repair contrary to Ringer berg's observations and they manifested a clinical success of 100 % using umbilical fat in their study.

The harvesting of the abdominal wall fat was technically easier; however it added the need of draping another surgical field in operative procedure. The postoperative care for abdominal incision necessitates an exposure that is not convenient for the usual ENT outpatient clinic.

The ear lobule fat has the advantage of same surgical field; however it is more difficult to harvest a fat plug especially if a large one is needed because of the possibility to injure the anterior skin of the ear lobule. The presence of piercing for ear rings in females further reduces the availability of the fat graft. In our study both the abdominal fat and ear lobule fat had same success rate for fat graft Myringoplasty.

Roe Landsberg et al. performed fat graft Myringoplasty on 38 perforations and found successful closure in 81.6%. They also described significant improvement in speech reception threshold (18.5 ± 7.7 dB vs. 23.5 ± 8 dB).

38 out of 40 patients (95%) showed good graft uptake. Preoperatively the mean hearing loss was 22.2 with standard deviation of 5.12. The postoperative pure tone audiometry was done after 2 months of surgery, which showed that average gain in hearing was 2.89dB. Postoperative pure tone audiometry, the mean was 19.4 dB with standard deviation of 4.24, the mean hearing gain being 2.89dB. Caye-Thomsasen et al (2007) in their study of 26 cases, the mean preoperative pure tone average was 20.1dB, the mean postoperative pure tone average was 11.5dB and thus a hearing gain of 8.6dB.

Brown C et al⁴⁵ (2002) in their study of 193 patients Myringoplasty, the mean preoperative air conduction average was 35dB while the mean postoperative average was 25dB, thus average air conduction improvement was 10dB.

Average hearing gain in our study was 2.89dB.

CONCLUSION

In this study we have achieved a high success rate (95 %) for repair of small dry central perforation of tympanic membrane with fat graft.

FAT GRAFT MYRINGOPLASTY is a safe and effective technique for closure of small dry central perforation of TM. The advantages of this technique are simple, no need for GA, need minimal sedation, no need of hair shaving, less operating time, reduced otological trauma from manipulating tympanic cavity, faster recovery with no need of post operative dressing, cost effective, bilateral perforation can be repaired using fat graft in the same setting, minimum post operative morbidity.

It can be performed as an outpatient procedure, and the patient can be discharged on the same day. It causes minimal discomfort and high success rate after proper case selection.

Ear lobule fat can be easily harvested in a very short time and there is no visible scar and minimal donor site morbidity.

Abdominal fat graft is as effective as ear lobule fat, has cosmetic advantage, sufficient in quantity and should be taken into consideration when planning fat as the graft source.

The success rate of fat Myringoplasty is very high and comparable to the results of Temporalis fascia Myringoplasty.

So Fat Graft Myringoplasty is a successful simple procedure for repair of small sized perforation as a DAY CARE SURGERY.

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PROFORMA

Name : Age/ Sex IP No.
Address: DOE: Occupation:

Complaints:

H/o Present illness

Details of complaints

Mode of onset

Time of onset and Duration

Course

Unilateral / bilateral

Aggravating / Relieving factors

H/o ear discharge – (foul smelling +/-, blood stained +/-)

H/o hard of hearing

H/o ear pain

H/o blocking sensation in ear

H/o ringing sensation in ear

H/o headache

H/o trauma to ear

H/o previous ear surgery

H/o Recurrent upper respiratory tract infection / sneezing / allergy /

Irritation and watering of eyes

H/o fever

H/o Nasal discharge / post nasal drip

PAST HISTORY

H/o similar complaints before

H/o previous surgery

H/o Noise trauma

H/o previous trauma

H/o Bleeding diathesis

H/o Drug allergy

Treatment History

Duration of treatment

Medical / Surgical

Medical - Topical / Oral

Improvement if any

Personal History

Diabetes / Hypertension / Pulmonary TB / Seizure / Bronchial asthma

Sinusitis / Allergic rhinitis

Smoking / Alcoholic

Psychiatric disturbance

Family History

H/o similar complaints in family

General Examinations:

Patients Conscious,

Oriented,

Febrile,

Anaemia +/-

Icterus +/-,

Generalized lymphadenopathy +/-,

Generalized edema +/-,

Clubbing +/- ,

Cyanosis+/-

RS - NVBS, no added sounds

CVS – S1 S2, no murmur

P/A – soft, no organomegaly

CNS – NFND

LOCAL EXAMINATION OF EAR

EAR	RIGHT	LEFT
PINNA		
PREAURICULAR REGION		
POSTAURICULAR REGION		
EXTERNAL ACOUSTIC MEATUS		
TYMPANIC MEMBRANE PERFORATION SIZE SITE MARGIN		
MIDDLE EAR MUCOSA		
TUNING FORK TEST RINNE WEBER ABC		
TRAGAL SIGN		
MASTOID TENDERNESS		
FACIAL NERVE FUNCTION		
NYSTAGMUS		

NOSE	RIGHT	LEFT
EXTERNAL NOSE		
NASAL VESTIBULE		
NASAL CAVITY		
NASAL SEPTUM		
NASAL MUCOSA		
INFERIOR TURBINATE		
MIDDLE TURBINATE		

EXAMINATION OF ORAL CAVITY:

EXAMINATION OF THROAT:

EXAMINATION OF NECK:

PROVISIONAL DIAGNOSIS:

PRE OPERATIVE EVALUATION:

1. OTOENDOSCOPIC EXAMINATION OF CENTAL PERFORATION – site, shape, margin, middle ear mucosal status
 - i. According to site of perforation – Anterior
 - a. Posterior
 - b. Central
2. PURE TONE AUDIOGRAM - HEARING LOSS WITH AIR BONE GAP MEASUREMENT (COHL / SNHL)
3. CT TEMPORAL BONE – ANY ASSOCIATED MIDDLE EAR / MASTOID BONE PATHOLOGY
4. DNE to rule out RHINOSINUSITIS
5. ROUTINE INVESTIGATION FOR ASSESSMENT FOR SURGERY

DIAGNOSTIC NASAL ENDOSCOPY PROFORMA

Govt. Rajaji Hospital, Madurai

Department of ENT

Name: _____ Age / Sex : _____
 IP/OPNo. _____ Date : _____
 Indications :
 Headache : _____
 Nasal block : _____
 Nasal discharge : _____
 Epistaxis : _____
 Anosmia : _____
 Sneezing : _____
 Scope(s) used : 0° / 30° / 45°

I – Pass Nasal mucosa Inferior turbinate Inferior Meatus ET – orifice Nasopharynx Fossa of Rossemuller		
II – Pass Nasal mucosa Superior Turbinate / Meatus Supreme Turbinate / Meatus Spheno ethmoidal Recess Sphenoid ostia		
III – Pass Nasal Mucosa Middle Turbinate Middle Meatus Uncinate Bulla Hiatus Accessory Ostia		
Nasal septum & Mucosa		

Conclusion :

Advice :

ABBREVIATIONS

TM	-	Tympanic Membrane
FGM	-	Fat Graft Myringoplasty
PTA	-	Pure Tone Audiogram
CP	-	Central Perforation
dB	-	Decibels
COHL	-	Conductive Hearing Loss
SNHL	-	Sensory Neural Hearing Loss
CT	-	Computed Tomography
ABG	-	Air Bone Gap
FPM	-	Fat Plug Myringoplasty

SL.NO	NAME	AGE	SEX	IP.NO	SIDE	AETIOLOGY	TYPES OF PERFORATION	PRE OP PTA	DNE	CT TEMPORAL BONE	DONOR SITE	TOTAL OPERATION TIME (MIN)	SURGICAL OPERATION TIME(MIN)	GRAFT UPTAKE	POST OP PTA	COMPLICATIONS
1	KRISHNAMMAL	47	F	112017	R	1	CENTRAL	15	NORMAL	NORMAL	EAR LOBULE	40	20	YES	15	NO
2	MUTHULAXMI	24	F	110001	R	1	CENTRAL	23	NORMAL	NORMAL	EAR LOBULE	45	20	YES	20	NO
3	REVATHY	29	F	110215	L	1	POSTERIOR	20	NORMAL	NORMAL	ABDOMINAL	50	30	YES	20	NO
4	SABARIMALAI	19	M	110215	L	2	CENTRAL	16	NORMAL	NORMAL	EAR LOBULE	40	25	YES	15	NO
5	KARUPPANNAN	19	M	116747	L	1	POSTERIOR	22	NORMAL	NORMAL	EAR LOBULE	35	15	YES	16	NO
6	GANESAN	30	M	110436	R	1	CENTRAL	16	NORMAL	NORMAL	EAR LOBULE	45	20	YES	15	NO
7	RAJAMANI	42	F	571	R	2	CENTRAL	25	NORMAL	NORMAL	EAR LOBULE	40	25	YES	20	NO
8	THANGAM	23	M	56388	R	3	ANTERIOR	30	NORMAL	NORMAL	ABDOMINAL	50	35	NO	30	RESIDUAL PERFORATION
9	MURUGESAN	39	M	113601	L	2	POSTERIOR	23	NORMAL	NORMAL	EAR LOBULE	35	20	YES	27	NO
10	TAMILSELVI	34	F	114061	L	1	ANTERIOR	17	NORMAL	NORMAL	EAR LOBULE	40	20	YES	16	NO
11	ARIVARASAN	28	M	384	R	1	POSTERIOR	25	NORMAL	NORMAL	EAR LOBULE	40	20	YES	17	NO
12	SATHISH	26	M	113299	R	2	CENTRAL	16	NORMAL	NORMAL	EAR LOBULE	45	20	YES	25	NO
13	RAVIKUMAR	38	M	38499	L	1	POSTERIOR	30	NORMAL	NORMAL	ABDOMINAL	45	25	YES	27	NO
14	SUDHA	22	F	46833	R	1	ANTERIOR	28	NORMAL	NORMAL	EAR LOBULE	35	20	YES	25	NO
15	RAJANGAM	43	M	113290	R	2	CENTRAL	15	NORMAL	NORMAL	EAR LOBULE	40	20	YES	15	NO
16	POTHUMPONNU	35	F	37414	L	1	POSTERIOR	26	NORMAL	NORMAL	EAR LOBULE	40	20	YES	23	NO

17	MADURAIVEERAN	26	M	38963	L	2	CENTRAL	28	NORMAL	NORMAL	ABDOMINAL	55	30	YES	17	NO
18	THAVAMANI	29	M	38999	L	1	ANTERIOR	15	NORMAL	NORMAL	EAR LOBULE	35	20	YES	15	NO
19	RAJA	19	M	34804	R	1	CENTRAL	19	NORMAL	NORMAL	EAR LOBULE	40	20	YES	17	NO
20	ESAKKIAMMAL	41	F	34892	R	2	POSTERIOR	30	NORMAL	NORMAL	EAR LOBULE	40	15	YES	23	NO
21	THANIKODI	35	M	113431	L	1	CENTRAL	25	NORMAL	NORMAL	ABDOMINAL	50	25	YES	25	NO
22	LAKSHMI	42	F	110088	L	1	CENTRAL	27	NORMAL	NORMAL	EAR LOBULE	35	15	NO	27	INFECTION
23	SARADHA	39	F	113513	R	2	ANTERIOR	19	NORMAL	NORMAL	EAR LOBULE	40	20	YES	19	NO
24	DEVENDRAN	37	M	113611	R	2	POSTERIOR	20	NORMAL	NORMAL	ABDOMINAL	45	25	YES	17	NO
25	MURUGAN	26	M	48491	R	1	CENTRAL	25	NORMAL	NORMAL	EAR LOBULE	40	25	YES	17	NO
26	SARASWATHI	44	F	48999	R	2	CENTRAL	15	NORMAL	NORMAL	ABDOMINAL	50	30	YES	15	NO
27	SUBASH	28	M	36842	L	2	POSTERIOR	29	NORMAL	NORMAL	EAR LOBULE	40	20	YES	23	NO
28	RAJATHI	46	F	116113	L	1	CENTRAL	25	NORMAL	NORMAL	ABDOMINAL	55	30	YES	18	NO
29	VENKATESH	30	M	113143	L	1	POSTERIOR	23	NORMAL	NORMAL	EAR LOBULE	40	20	YES	19	NO
30	MOHAMMED AZAR	31	M	114649	L	2	CENTRAL	25	NORMAL	NORMAL	EAR LOBULE	45	20	YES	23	NO
31	PONNAMAL	33	F	59438	L	2	CENTRAL	15	NORMAL	NORMAL	ABDOMINAL	50	30	YES	15	NO
32	SHANTHI	28	F	114391	R	1	POSTERIOR	16	NORMAL	NORMAL	EAR LOBULE	40	25	YES	16	NO
33	RABEEK	24	M	110008	R	1	CENTRAL	28	NORMAL	NORMAL	EAR LOBULE	35	20	YES	20	NO
34	WILSON	39	M	55609	R	2	CENTRAL	21	NORMAL	NORMAL	EAR LOBULE	40	20	YES	17	NO
35	CHITHRA	42	F	56381	L	1	POSTERIOR	24	NORMAL	NORMAL	ABDOMINAL	50	35	YES	16	NO
36	TAMIL	19	M	40113	L	3	ANTERIOR	27	NORMAL	NORMAL	EAR LOBULE	40	20	YES	23	NO
37	SENTHIL	32	M	5010	R	2	CENTRAL	15	NORMAL	NORMAL	ABDOMINAL	50	30	YES	15	NO
38	RAJESHWARI	30	F	114211	L	1	POSTERIOR	28	NORMAL	NORMAL	EAR LOBULE	45	25	YES	17	NO

39	ARUMUGAM	43	M	114634	R	1	CENTRAL	18	NORMAL	NORMAL	ABDOMINAL	50	25	YES	16	NO
40	SUNDAR	21	M	58312	L	2	POSTERIOR	24	NORMAL	NORMAL	EAR LOBULE	40	20	YES	20	NO



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**ETHICS COMMITTEE
 CERTIFICATE**

Name of the Candidate : Dr.Dhanalakshmi. T
 Course : PG in MS., Otorhinolaryngology
 Period of Study : 2015-2018
 College : MADURAI MEDICAL COLLEGE
 Research Topic : Fat Graft myringoplasty:
 Repair of small dry central
 perforation of tympanic
 membrane: A prospective
 clinical study
 Ethical Committee as on : 21.04.2017

The Ethics Committee, Madurai Medical College has decided to inform
 that your Research proposal is accepted.

M. Shanthy
 Member Secretary
 Chairman
 Prof Dr V Nagarajan
 M.D., MNAMS, D.M., Dsc.,(Neuro), Dsc (Hon)
 CHAIRMAN
 IEC - Madurai Medical College
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